California Environmental Protection Agency

REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

AN AMENDMENT TO THE CALIFORNIA REGIONAL WATER QUALITY CONTROL PLAN COLORADO RIVER BASIN REGION TO REVISE INDICATOR BACTERIA FOR THE COACHELLA VALLEY STORM WATER CHANNEL

Water Boards

STAFF REPORT
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REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

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I. SUMMARY

An amendment to the Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board, Colorado River Basin Region (Regional Water Board), is proposed for the Coachella Valley Storm Water Channel (CVSC) to update water quality objectives for indicator bacteria to better protect human health against gastrointestinal illness. Specifically, this amendment proposes to use the bacterial indicator *E. coli* to evaluate risk of illness due to exposure to water borne disease-causing organisms. *E. coli* is the most reliable indicator bacteria for fresh water based on recent epidemiological studies, and recommendations by the United States Environmental Protection Agency (USEPA).

The CVSC is located in Coachella Valley in Riverside County, California. The Valley is largely agricultural utilizing groundwater and water from the Colorado River delivered by the Coachella Canal via the All-American Canal, for crop irrigation. CVSC is an unlined, engineered extension of the Whitewater River that functions as a conveyance channel for: (a.) irrigation return flows, (b.) treated wastewater from three permitted municipal wastewater treatment plants, (c.) wastewater discharged from one permitted fish farm, and (d.) urban and stormwater runoff. The channel is approximately 17 miles long, extending from the City of Indio to the north shore of the Salton Sea. Average annual flows in CVSC are decreasing due to changes in agricultural practices, and suburban development. The CVSC and its tributary drains provide habitat for a variety of wildlife including migratory songbirds, waterfowl, coyotes, raccoons, and rodents. Although recreation in the stormwater channel is prohibited by the Coachella Valley Water District (CVWD), people are known to recreate in and around the channel.

Water quality objectives, as defined in the California Water Code (CWC) Section 13050(h), are:

> *Limits or levels of water quality constituents or characteristics established for the reasonable protection of beneficial uses or the prevention of nuisance within a specific area.*

Water quality objectives for a given constituent/characteristic are determined by the designated beneficial uses for that water body. Water quality objectives for bacteria consider the degree of risk from human exposure (e.g., immersion vs. incidental contact), epidemiological research, and use of indicator organism characteristics, since it is not feasible or reasonable to test for all potential pathogenic organisms. Hence, bacteria objectives will differ for water bodies with different beneficial uses.

Designated beneficial uses for CVSC include contact recreation (REC-I), defined in the Basin Plan as:

> *Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, white water activities, fishing and use of natural hot springs*.

To protect the REC-I beneficial use the Basin Plan currently requires analysis for three indicator bacteria: E. coli, enterococcus, and fecal coliforms. This Basin Plan amendment proposes to revise bacteria objectives in CVSC to reflect that specified in *Ambient Water Quality Criteria for Bacteria – 1986* (USEPA, 1986), which designates E. coli as the sole indicator bacterium for protecting the REC-I beneficial use for fresh waters. Enterococcus is recommended for saline water but may also be used for fresh water (USEPA, 1986).

II. RATIONALE FOR BASIN PLAN AMENDMENT

In March 1999, USEPA stated in *Action Plan for Beaches and Recreational Waters*:

> …*Where a state does not amend its water quality standards to include the 1986 criteria, USEPA will act under Section 303(c) of the Clean Water Act to promulgate the criteria with the goal of assuring that the 1986 criteria apply in all states….*

Nevertheless, the USEPA is no longer encouraging states to replace fecal coliforms with the 1986 criteria, since they [USEPA] are moving forward to develop new criteria, however they will continue to support states that choose to pursue the old criteria, as E. coli/enterococcus are more scientifically defensible than fecal coliform criteria. More specifically, the USEPA has determined that for fresh recreational waters, E. coli and enterococcus equally demonstrate a greater correlation between bacterial densities and gastrointestinal illnesses in humans, than do fecal coliforms (USEPA, 1986).

The water quality standards outlined in the Basin Plan are the cornerstone of all activities of the Regional Water Board, and should rely on the best science available to protect water quality and beneficial uses. The bacteria objectives proposed for CVSC are based on research conducted by the USEPA, which in their 1986 paper referenced above, provides new information on the most reliable "indicators" for predicting the presence of disease-causing organisms, and correlating these indicators to swimming-related illness rates in humans.

Water quality standards are defined as the beneficial uses of a water body, the water quality objectives that protect those beneficial uses, and the State's antidegradation policy [40 CFR 131.3(i)]. The proposed Basin Plan amendment simply recommends revising water quality objectives for bacterial indicators for CVSC; not revising the beneficial uses of CVSC. Although indicator organisms may not cause illness, they are associated with fecal contamination, and have

characteristics that allow them to be good predictors of pathogens in water bodies. Pathogens are disease-causing microorganisms that include viruses, protozoa, and bacteria, many of which cannot be measured directly. Water bodies may contain a large variety of pathogens, making measurement impractical even if techniques were available to detect all pathogens of concern. As a result, indicator organisms are used to predict health risks from pathogens present in water bodies.

III. PROPOSED CHANGES TO COACHELLA VALLEY STORM WATER CHANNEL WATER QUALITY OBJECTIVES

A. Current Objectives

Bacterial objectives in the current Basin Plan that protect the REC-1 (water contact) and REC-2 (non-water contact) uses include: E. coli, enterococcus, and fecal coliforms. Objectives for E. coli and enterococcus are as follows:

> *Based on a statistically sufficient number of samples, (generally not less than five samples equally spaced over a 30-day period), the geometric mean of the indicated bacterial densities should not exceed one or the other of the following:*

	REC 1	*REC 2*
E. coli	*126 per 100ml*	*630 per 100ml*
Enterococci	*33 per 100ml*	*165 per 100ml*

> *Nor shall any sample exceed the following maximum allowables:*

	REC 1	*REC 2*
E. coli	*400 per 100 ml*	*2000 per 100 ml*
Enterococci	*100 per 100 ml*	*500 per 100 ml*

The current Basin Plan objective for fecal coliforms is:

> ……..i*n waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml (State of California, 2006).*

History of Current Objectives:

The current fecal coliform objectives for waters designated REC-1 are based on a series of epidemiological studies conducted in the late 1940's / early 1950's, summarized by Stevenson (1953). These studies show a statistically significantly

increase in illness rates in individuals that swim in water with an average total coliform density of 2,300 organisms per 100 ml when compared to individuals swimming in water with an average total coliform density of 43 organisms per 100 ml. This total coliform index was translated into a fecal coliform index by using the ratio of fecal coliforms to total coliforms at one of the original study sites. Total coliform was translated to fecal coliform because fecal coliform is a better indicator of fecal contamination, and more stable than total coliform. Based on this ratio, it was assumed that statistically significant swimming-associated gastrointestinal illness will be observed at fecal coliform levels equal to or greater than 400 organisms/100 ml. The National Technical Advisory Committee (NTAC) of the Department of the Interior, which oversaw these initial epidemiological studies, found a detectable risk unacceptable, and so proposed a density of 200 fecal coliform per 100 ml as the criterion (NTAC, 1968). The NTAC further recommended that not more than 10 percent of samples should exceed 400 fecal coliforms per 100 ml. This fecal coliform criterion was again recommended by USEPA in 1976 (USEPA, 2007).

Justification for Revised Objectives

Preferred Indicator: The revised objectives are based on recent scientific studies sponsored by USEPA that correlate illness rates with bacterial indicator densities in recreational waters. These studies combined with new information now available for bacterial indicators, allows the most appropriate indicator to be selected for site-specific local conditions. The studies found that enterococcus and *E. coli* are the indicators most strongly correlated with gastroenteritis, whereas total coliform and fecal coliform only weakly correlate with gastroenteritis. USEPA also found that while enterococcus was more reliable than E. coli in “saline” waters, E. coli and enterococcus were equally efficient indicators for “fresh” waters. Since the regulated community is more familiar with analytical procedures for E. coli, this amendment requires analysis for E. coli rather than enterococcus, even though both indicators are “equally efficient” for fresh water. There is no disadvantage in using E. coli over enterococcus from a salinity perspective, given that CVSC is not a saline waterbody.

Numerical Limits: The USEPA has defined numerical targets for bacterial densities based on a recommended risk level of eight illnesses per 1,000 swimmers for heavily used beaches. For less frequently used beaches, USEPA offers an acceptable risk level of one percent, or ten illnesses per 1,000 swimmers. These numerical targets are based on frequency of recreational use, and are separated into three categories: (1) moderate full body contact recreation, (2) lightly used full body contact recreation, and (3) infrequently used full body contact recreation.

Although the CVSC likely falls into the “infrequently used” category, the Regional Water Board feels it is unnecessary to revise bacterial density limits. USEPA risk limits based on use frequency are outlined in the table below:

Table 1: **USEPA Recommended REC-1 Fresh Water Criteria for Bacteriological Densities**

Risk Level (%)	Indicator	Geometric Mean Density (Per 100ml)	Single Sample Maximum Allowable Density (per 100ml)		
			Moderate Full-body Contact (82^{nd} percentile)	Lightly Used Full-body Contact (90^{th} percentile)	Infrequently Used Full-body Contact (95th percentile)
0.8	E. coli	126	299	409	576
1.0	E. coli	206	489	668	940

Source: USEPA

Numerical limits were established by the USEPA for both a single sample maximum (SSM), and a Geometric Mean (GM). Excepting beach notification and closure decisions, the geometric mean is the more relevant value for CVSC to ensure appropriate actions are taken to protect and improve water quality, given that it is a more reliable measure, being less subject to random variation, and more directly linked to the underlying studies on which the 1986 bacteria criteria were based.

The SSM is valuable in that it may identify episodes of pollution, especially in waters like the CVSC that are prone to short-term spikes in bacteria concentrations. The SSM was initially developed as a statistical construction to allow decision makers to make informed decisions to open or close beaches based on small data sets, and were not designed to provide a further reduction in the design illness level provided for by the geometric mean criterion. While the SSM may give States and Territories the ability to make water body assessments when water body data is limited, the USEPA cautions that: *using the SSMs as values not to be surpassed for all Clean Water Act applications, even when the data set is large, could impart a level of protection much more stringent than intended by the 1986 bacteria criteria document* (USEPA, 2004).

Although USEPA has not established limits for REC-2 beneficial uses, it has approved the practice of establishing REC-2 limits that are five times the limits for REC-1 beneficial uses.

IV. ALTERNATIVES

1. *No action.*

If the Regional Water Board does not adopt revised standards consistent with USEPA's recommendations, the goals of the amendment may still be achieved by a similar statewide amendment currently being developed by the State Water

Board. The adoption of the State Water Board amendment will make bacteria objectives for all fresh REC-1 water bodies within the Region, including the CVSC, consistent with USEPA guidance.

2. *Adopt USEPA criteria to replace the current bacteria objectives for a 17- mile section of the Coachella Valley Storm Water Channel only.*

By adopting the proposed revisions to bacteria objectives for a specific portion of the CVSC, the Regional Water Board will make bacteria objectives for a 17-mile stretch of the CVSC consistent with USEPA guidance. Should the proposed amendment currently under development by the State Water Board be adopted, the amendment to the Basin Plan for the Colorado River Basin Region will be redundant, or require revision to be consistent with State rulings.

3. *Adopt USEPA criteria to replace the current bacteria objectives for all REC-1 fresh water bodies within the Region.*

By adopting the USEPA criteria for all REC-1 fresh water bodies in the Colorado River Basin Region, bacteria objectives for REC-1 fresh waters within the Region, including the CVSC, will be consistent with USEPA guidance. Should the proposed amendment currently pursued by the State Water Board be adopted, the Basin Plan amendment for the Colorado River Basin Region will be redundant, or require revision to be consistent with State rulings.

V. RECOMMENDED ALTERNATIVE

Regional Water Board staff recommend alternative two, that is, to adopt USEPA criteria to replace the current bacteria objectives for a 17-mile stretch of the CVWC. This will require revising Chapter 3 of the Basin Plan, *Water Quality Objectives*, by adding a new sub-section labeled *E*, titled *Coachella Valley Storm Water Channel*. This new sub-section will be preceded by sub-section *D, Irrigation Supply Canals*.

VI. OTHER CONSIDERATIONS

The Basin Planning process has been certified by the Secretary of Resources as functionally equivalent to the preparation of an initial study, a negative declaration, or environmental impact report (EIR) pursuant to the California Environmental Quality Act (CEQA). In lieu of these documents however, the Regional Water Board is required to prepare the following: (1.) a Basin Plan amendment; (2.) an Environmental Checklist that identifies potentially significant adverse environmental impacts of the Basin Plan amendment; and (3.) a staff report that describes the proposed amendment, reasonable alternatives, and mitigation measures to minimize any significant adverse environmental impacts

identified in the Checklist. Collectively, the Basin Plan amendment, Environmental Checklist, and staff report are functionally equivalent to an initial study, negative declaration, or EIR. The Environmental Checklist (attached to this report) concludes that no significant adverse impacts to the environment will be caused by the adoption and implementation of this Basin Plan amendment.

USEPA has determined that E. coli and enterococcus are equally efficient as pathogen indicators in fresh water however E.coli was selected over enterococcus as the water quality objective to protect the REC-1 beneficial use in CVSC, since the regulated community is more experienced and proficient with analytical procedures for E. coli. Economically, there is no significant difference in cost between the analytical methods for E. coli and enterococcus. For these reasons, E. coli was viewed as a more desirable indicator for the CVSC.

VII. RECOMMENDATION

Regional Water Board staff recommends the Regional Water Board adopt the proposed Basin Plan amendment for the CVSC.

REFERENCES

APHA (American Public Health Association). 2005. *Standard Methods for the Examination of Water and Wastewater*, 21st ed.; APHA, American Water Works Association, and Water Pollution Control Federation: Washington, DC. 9-1.

State of California. California Regional Water Quality Control Board, Colorado River Basin Region 7. *Water Quality Control Plan*. June, 2006.

Stevenson, Albert H. "Studies of Bathing Water Quality and Health." American Journal of Public Health. *43(5) (*1953) : 529-38.

United States Environmental Protection Agency. 1986. Ambient Water Quality Criteria for Bacteria – 1986. EPA440/5-84-002.

United States Environmental Protection Agency. 1999. Action Plan for Beaches and Recreational Waters. EPA600/R-98/079.

United States Environmental Protection Agency. Water Quality Standards for Coastal Recreation Waters: Using Single Sample Maximum Values in State Water Quality Standards. EPA-823-F-06-013. Internet. August 2006. Available: http://www.epa.gov/waterscience/beaches/files/SSM.pdf. Pg 3.

United States Environmental Protection Agency. The Evolution of Water Quality Criteria in the United States, 1922-2003. Internet. 2007. Available: http://media.wiley.com/product_data/excerpt/2X/04700337/047003372X.pdf. 5-6.